

King City, Missouri
Water Supply Study
City Lakes (South Lake and 3 North Lakes)

King City is located in Southwest Gentry County on Highway 169, South of Stanberry.

There are four lakes in total. The South Lake is two miles Southeast of town. There are three North Lakes about one mile Northeast of town and these lakes are in series.

King City water use averages 125,000 gallon per day.

The drainage area of the South lake is 0.86 Sq. Mi.

The drainage area of the Upper North lake is 0.09 Sq. Mi.

The incremental drainage area of the Middle North Lake is 0.375 Sq. Mi.

The incremental drainage area of the Lower North Lake is 0.334 Sq. Mi.

Total drainage area of the North Lakes system is 0.799 square miles.

King City Lakes analysis consisted of using the NRCS's computer program called "RESOP". Following is the data and procedures for input to the program.

STO-AREA Elevation-Storage and Elevation-Area data were determined from
July 11, 2000 survey made by USGS.

KING CITY SOUTH LAKE

<u>Elevation (feet)</u>	<u>Area (acres)</u>	<u>Volume (acre-ft)</u>	
1010.0	0.02	0.003	
1012.0	0.54	0.38	
1014.0	2.36	2.97	
1016.0	5.15	10.55	
1018.0	8.08	23.83	
1020.0	11.24	43.23	
1022.0	15.05	69.38	
1024.0	18.60	103.34	
1025.4	21.09	131.03	Water surface elevation on 7/19/00
1026.0	22.36	144.06	
1028.0	27.02	193.35	
1030.0	32.73	252.81	
1032.0	39.42	324.85	
1034.0	47.66	411.55	Approximate top of dam

KING CITY LAKE "NORTH"

King City #1 (See Reference Figure) (Lower Lake)

<u>Elevation (feet)</u>	<u>Area (acres)</u>	<u>Volume (acre-ft)</u>
1016.0	0.85	0.17
1017.0	3.82	2.17
1018.0	7.66	8.00
1019.0	9.98	16.92
1020.0	11.93	27.91
1021.0	13.54	40.65
1022.0	14.83	54.86
1023.0	16.04	70.28

1024.0	17.17	86.90	
1025.0	18.19	104.59	
1026.0	19.27	123.33	
1027.0	20.61	143.23	
1028.0	21.77	164.45	
1029.0	22.98	186.83	
1030.0	23.93	210.30	
1031.0	24.81	234.67	
1031.7	25.42	252.24	Water surface elevation on 7/19/00
1032.0	25.67	259.91	
1033.0	26.49	285.99	
1034.0	27.29	312.88	
1034.7	27.84	332.17	Top of spillway

KING CITY LAKE "NORTH"

King City #1a Small Lake - Not used for water supply.
(This lake is a sediment trap)

Elevation (feet)	Area (acres)	Volume (acre-ft)	
1031.0	0.44	0.30	
1032.0	0.86	0.94	
1032.6	1.33	1.57	Water surface elevation on 7/19/00
1033.0	1.42	2.13	
1034.0	1.62	3.65	
1034.7	1.77	4.83	

KING CITY LAKE "NORTH"

King City #2 (See Reference Figure) (Middle Lake)

Elevation (feet)	Area (acres)	Volume (acre-ft)	
1026.0	1.11	0.18	
1027.0	3.54	2.39	
1028.0	5.68	7.11	
1029.0	6.64	13.30	
1030.0	7.67	20.44	
1031.0	8.43	28.50	
1032.0	8.97	37.22	
1033.0	9.32	46.36	
1034.0	9.67	55.86	
1034.6	9.88	61.73	Water surface elevation on 7/19/00
1035.0	10.03	65.71	Spillway elevation

KING CITY LAKE "NORTH"

King City #3 (See Reference Figure) (Upper Lake)

Elevation (feet)	Area (acres)	Volume (acre-ft)	
1039.0	0.26	0.10	
1040.0	0.55	0.51	
1041.0	0.93	1.25	
1042.0	1.26	2.35	
1043.0	1.65	3.79	
1044.0	2.30	5.74	
1045.0	2.91	8.38	

1046.0	3.27	11.47
1047.0	3.50	14.87
1048.0	3.66	18.45
1049.0	3.83	22.19
1049.7	3.96	24.92 Water surface elevation on 7/19/00
1050.0	4.01	26.12
1051.0	4.28	30.25
1052.0	4.70	34.72
1053.0	5.25	39.68 Approximate top of dam

KING CITY LAKE "NORTH"

King City #3a Small Lake - Not used for water supply.
(This lake is a sediment trap)

Elevation (feet)	Area (acres)	Volume (acre-ft)
1034 0	.19	0.08
1035 0	.64	0.36 Water surface elevation on 7/19/00
1036 0	.81	1.08

	Max. Storage (Ac.Ft.)	Min. Pool Storage (Ac.Ft.)
South Lake	411	17
North Lake (Upper)	39	6
" " (Middle)	65	20
" " (Upper)	332	40

LIMITS Starting storage was considered at maximum pool.

The upper North Lake and The South Lake survey data indicate the top of dam as the upper limit and the lower and middle North lakes the spillway is listed as the upper limit. This is inconsistent with the other surveys being done during this survey contract. Because of this, it is assumed that it the upper north lake and south lakes are mislabeled in the survey data. Also, the south lake was constructed in the last ten years at which time there was surely some kind of demand study made and results of this study with maximum pool at the top survey elevation shows the present demand and the optimized demand to be very close.

The drainage area of the South Lake is 0.86 square miles.
The drainage area of the Upper North Lake is 0.09 square miles square miles.
The Incremental drainage area of the Middle North Lake is 0.375 square miles.
The Incremental drainage area of the Lower North Lake is 0.334 square miles

GENERAL The adjustment to convert from pan evaporation to lake evaporation was made for the control word EVAP. The factor was 0.76. As a result a factor of 100. was used here.

The record period of drought is in the 1950's.
Analysis began in January 1951 and ended December 1959.

SEEPAGE The reservoir seepage varied from 0 seepage near empty to a maximum of 1 inch per month when at full pool. The material in the dam is compacted earth of loamy clay soils. The lakes are shallow so that static pressure is low. As a result seepage is small.

RAINFALL Rainfall data came from the King City, Mo. rain gage. For periods of missing data the Albany gage was used to fill in the missing dates.

RUNOFF	This is the runoff into the lake from its drainage area. Monthly runoff volumes in watershed inches were determined at the White Cloud Creek Stream Gage. White Cloud Creek is located about 25 miles WNW of King City. The drainage at the gage is 6.06 square miles. Monthly runoff was compared to the rainfall and if the results did not appear reasonable, adjustments were made for that month by looking at individual rains and estimating antecedent moisture then adjusting runoff based on NRCS's runoff curve numbers.
EVAP.	Pan evaporation at the Lakeside gaging station was used as a base because it has data for year around evaporation. This data was updated with gage data from stations at Spickard, New Franklin, and Columbia. Depending on the latest data for the station nearest to King City. The adjustment factor of 0.76 to convert from pan to lake evaporation was applied at this step.
DEMAND	This was determined by city records. King City has a total daily use of 125,000 gallons per day. To determine the volume to be used from each lake, an optimized analysis was made and then the same percentages for each lake were used to distribute the 125,000 gallons per day between the four lakes for current demand.
OTHER	This refers to other inflows or outflows. Because there was nothing added or used, this control word was not used.

King City, Missouri

Water Supply Study

South Lake

Storage Volume

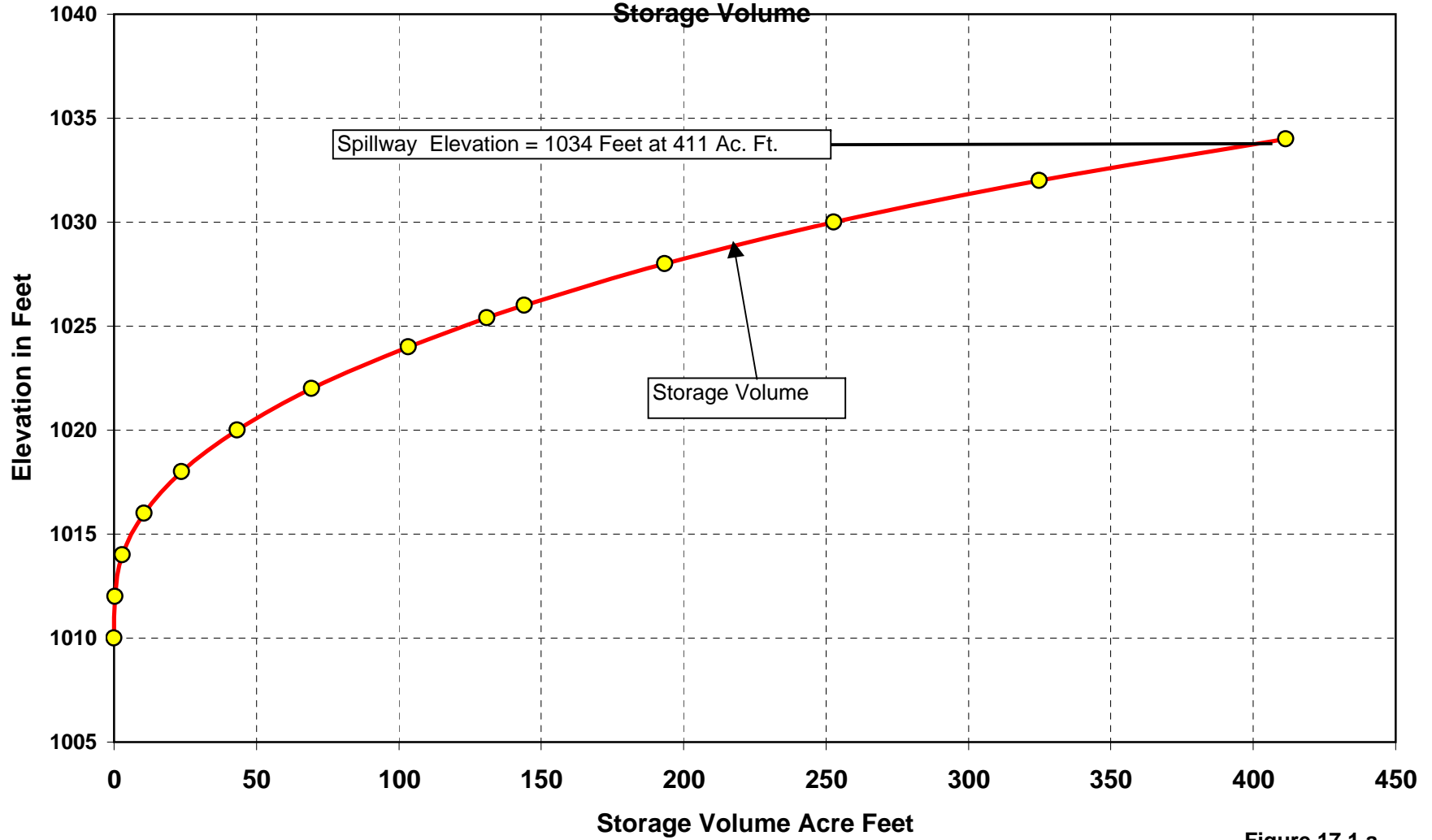


Figure 17.1.a

King City, Missouri

Water Supply Study

South Lake

Surface Area

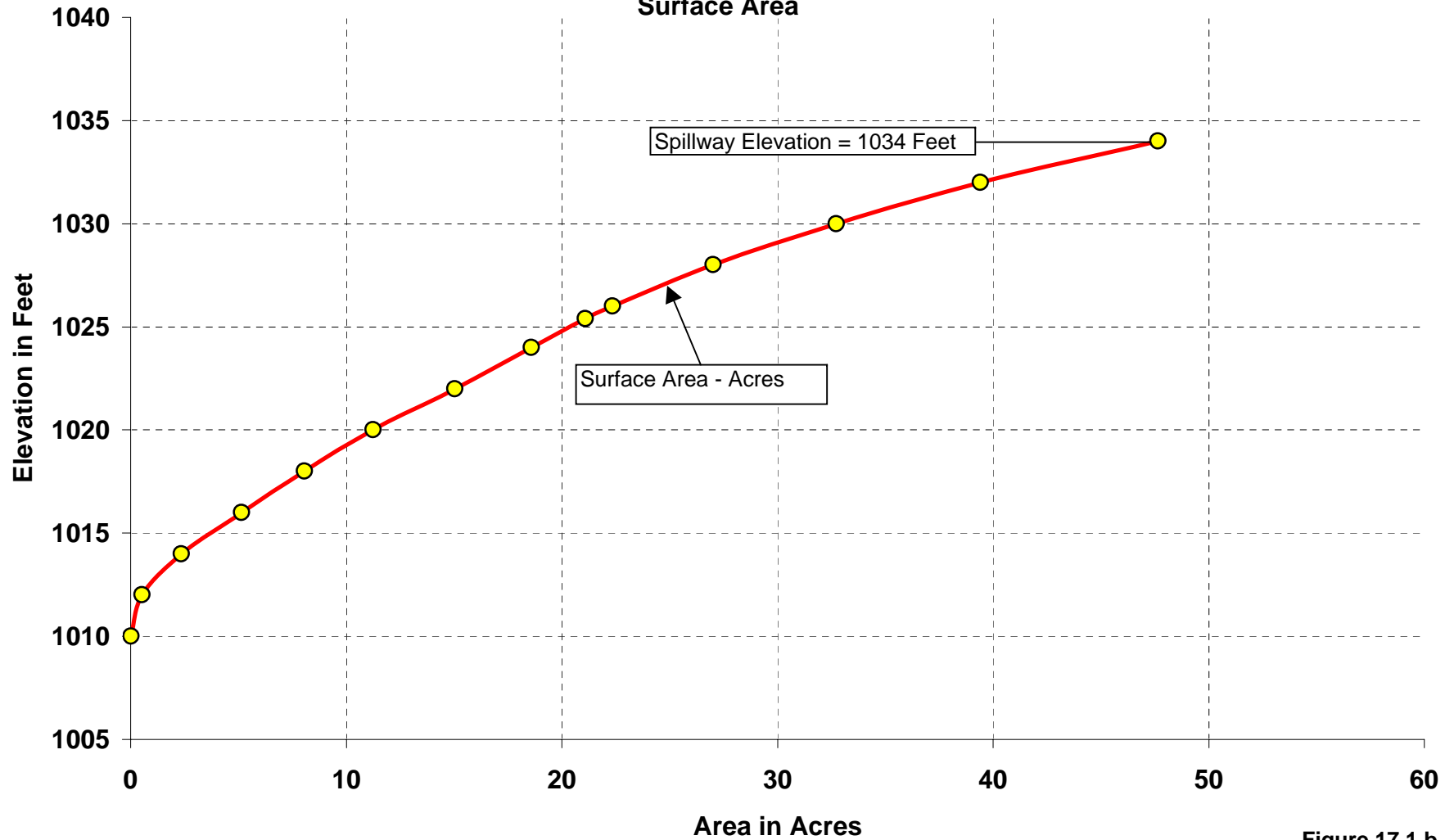


Figure 17.1.b

King City, Missouri
Water Supply Study
Lower North Lake #1
Storage Volume

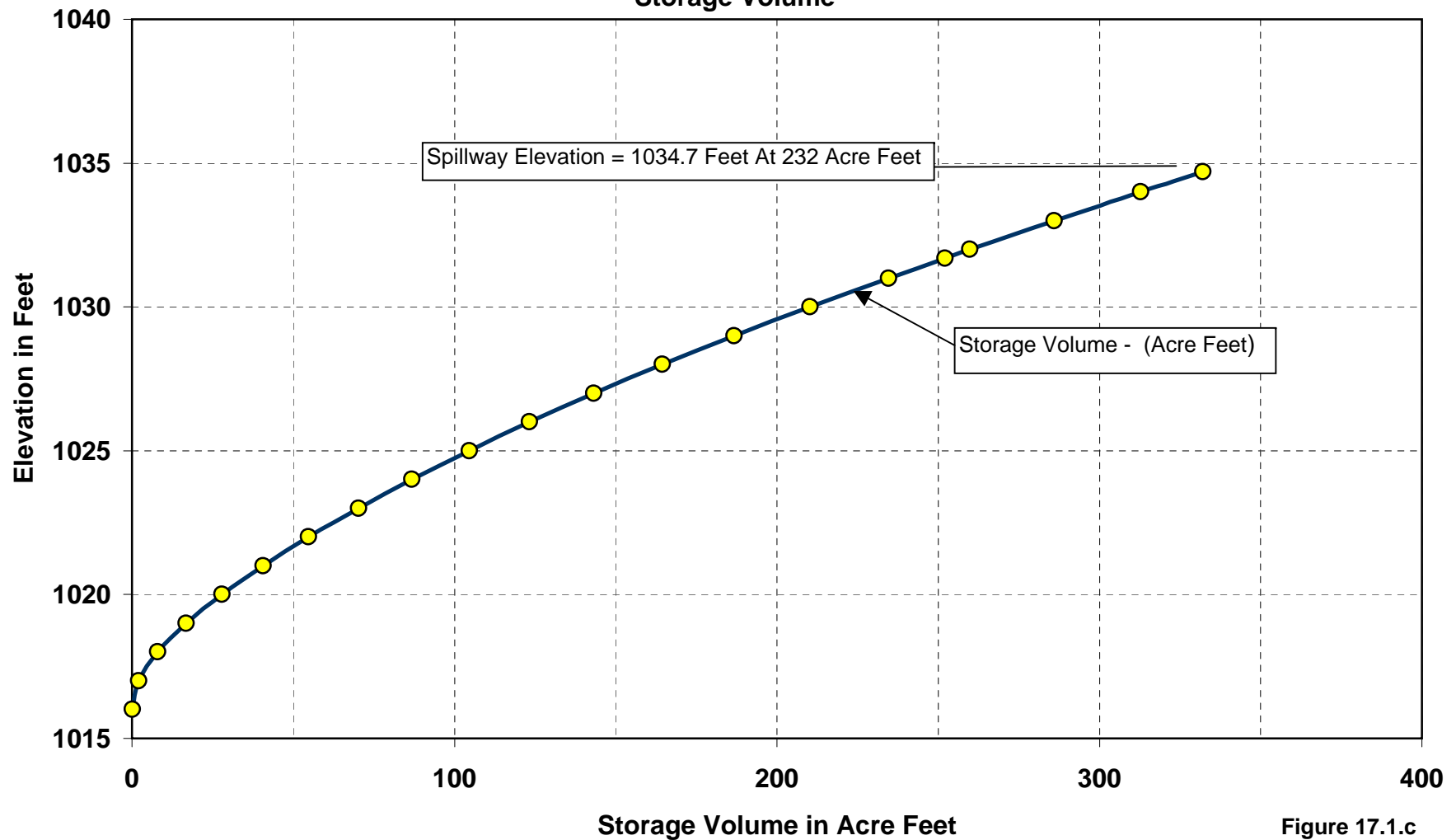


Figure 17.1.c

King City, Missouri
Water Supply Study
Lower North Lake #1
Surface Area

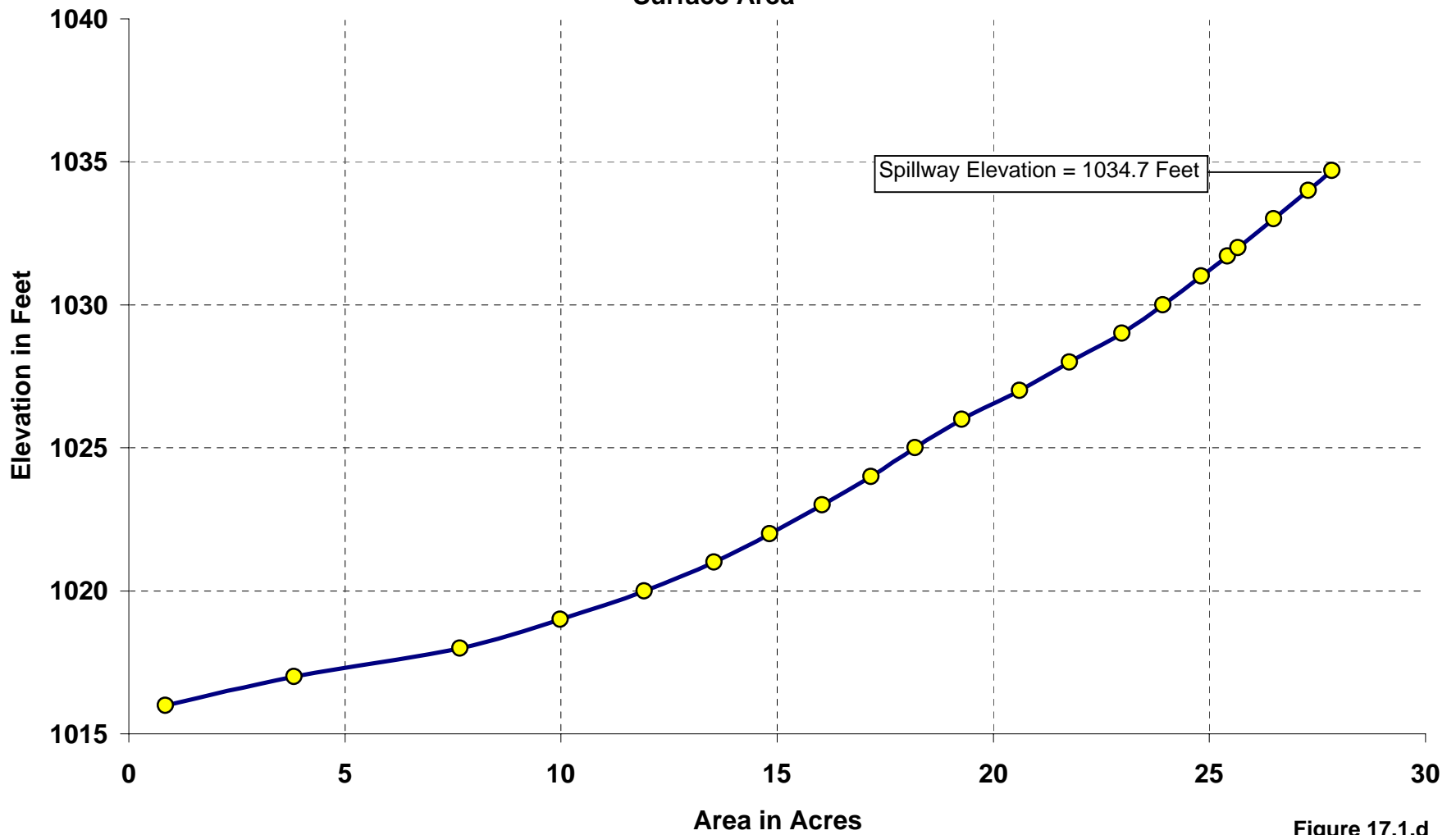


Figure 17.1.d

King City, Missouri

Water Supply Study

Middle North Lake

Storage Volume

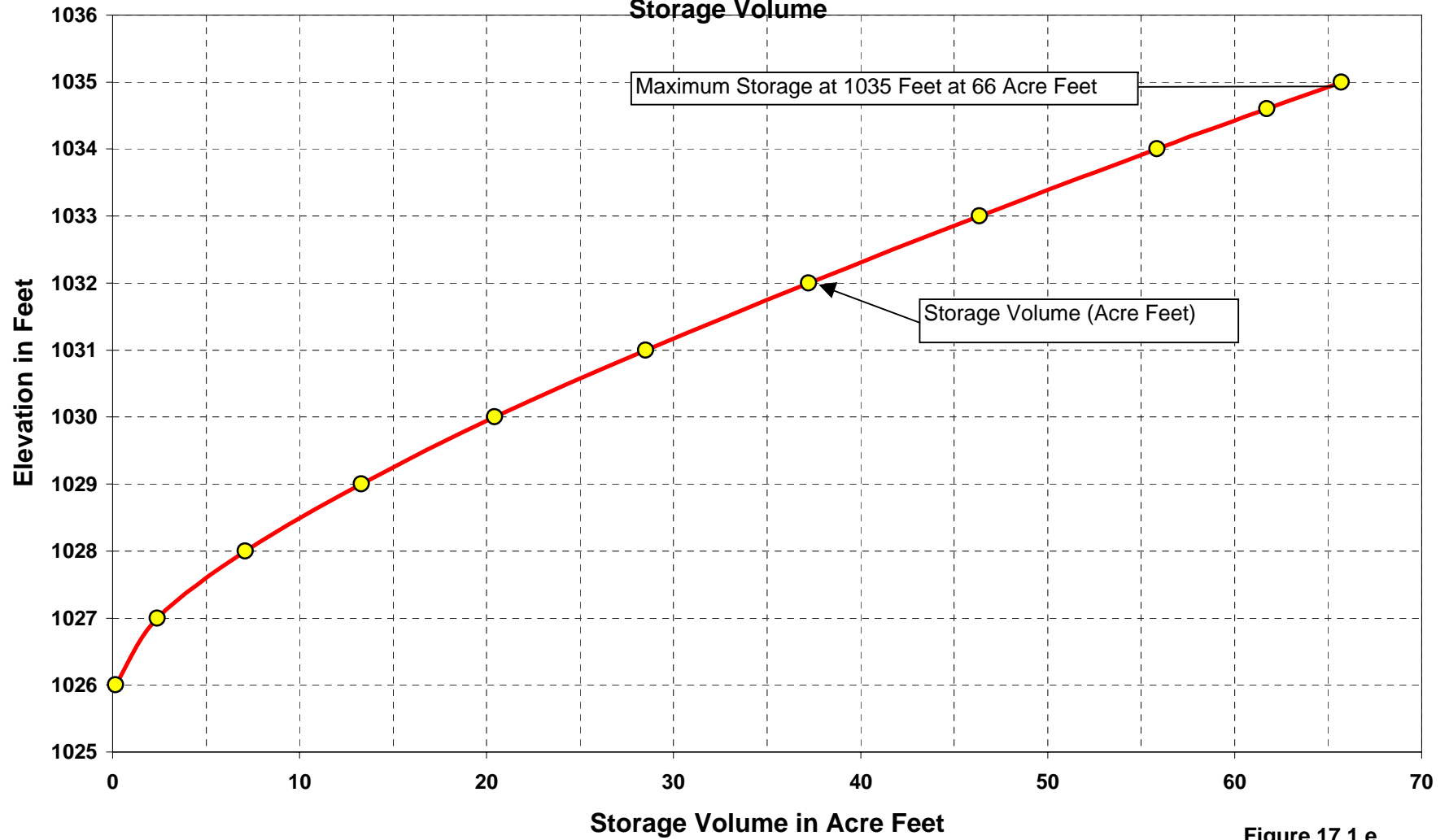


Figure 17.1.e

King City, Missouri
Water Supply Study
Middle North Lake #2
Surface Area

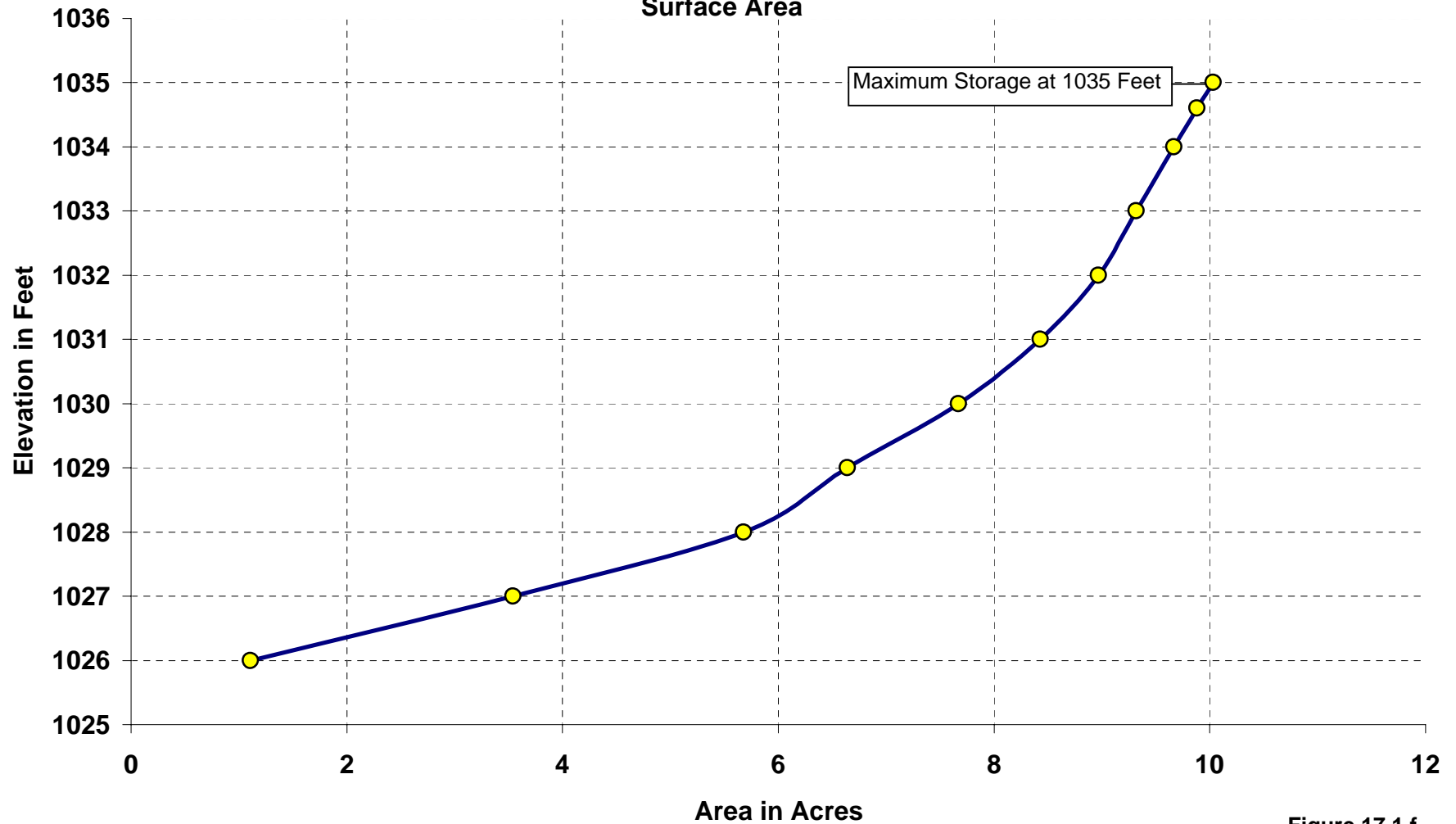


Figure 17.1.f

King City, Missouri
Water Supply Study
Upper North Lake No. 3
Storage Volume

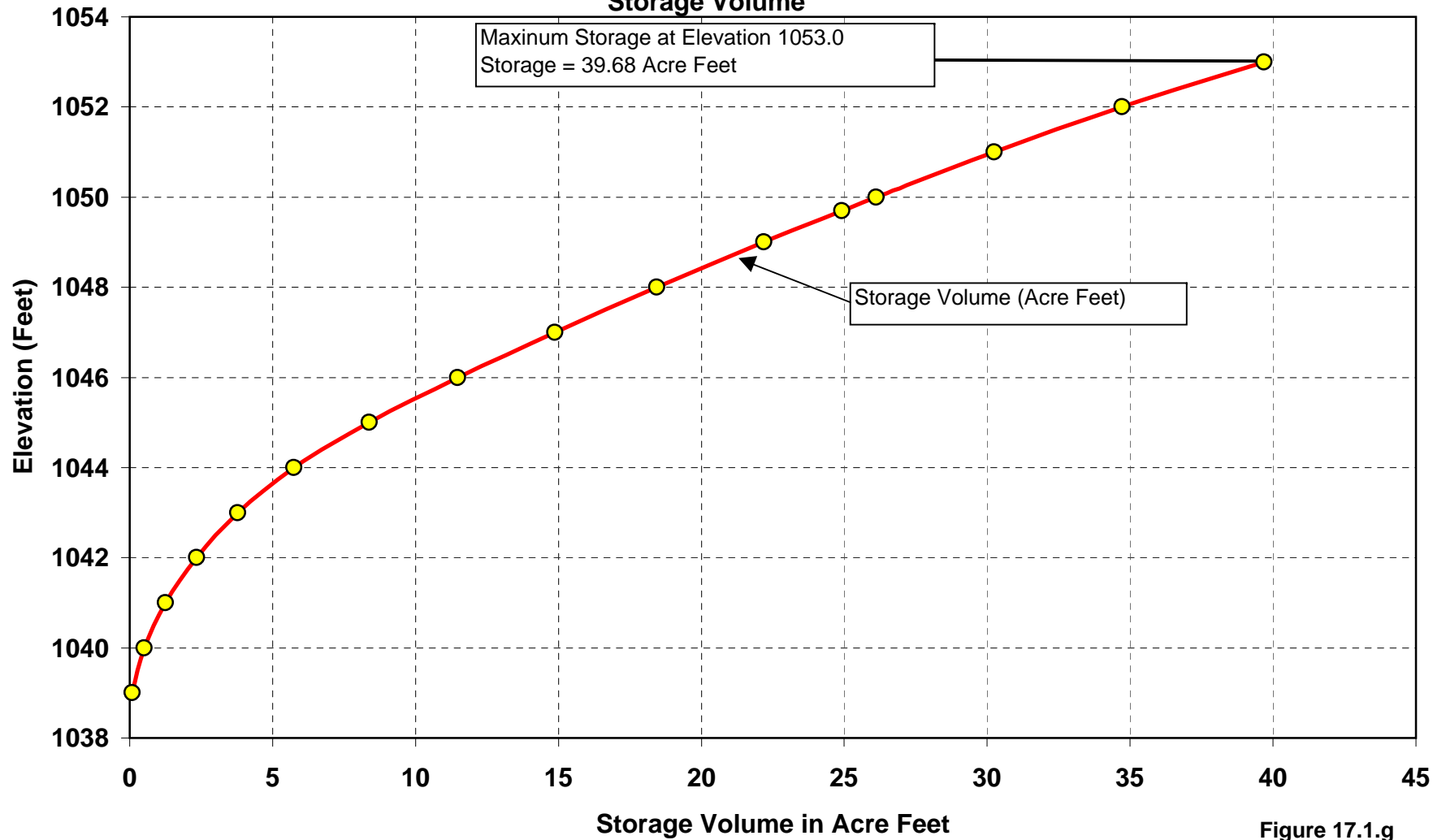


Figure 17.1.g

King City, Missouri

Water Supply Study

Upper North Lake #3

Surface Area

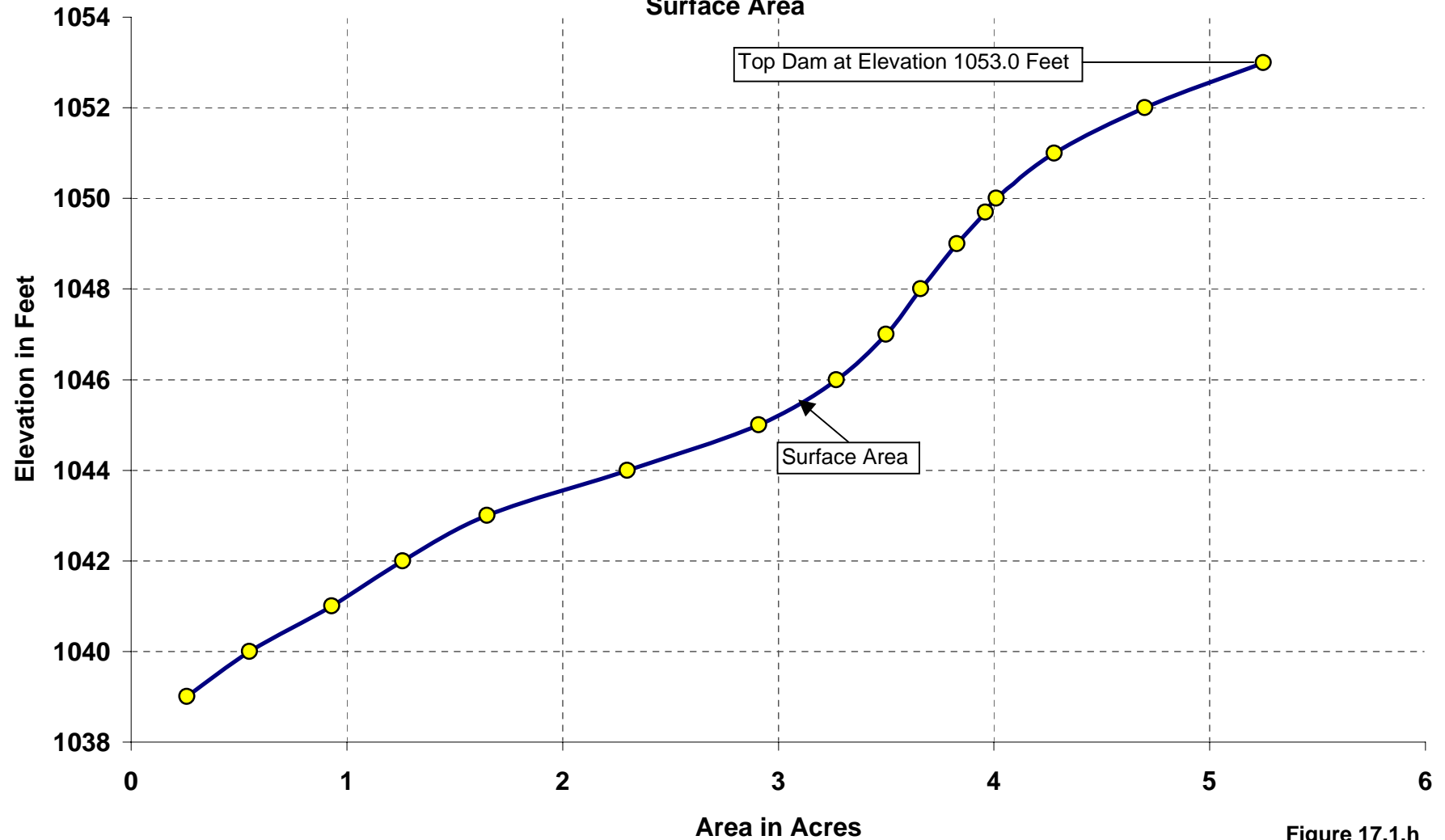


Figure 17.1.h

King City, Missouri
Water Supply Study
South Lake
Lake Storage

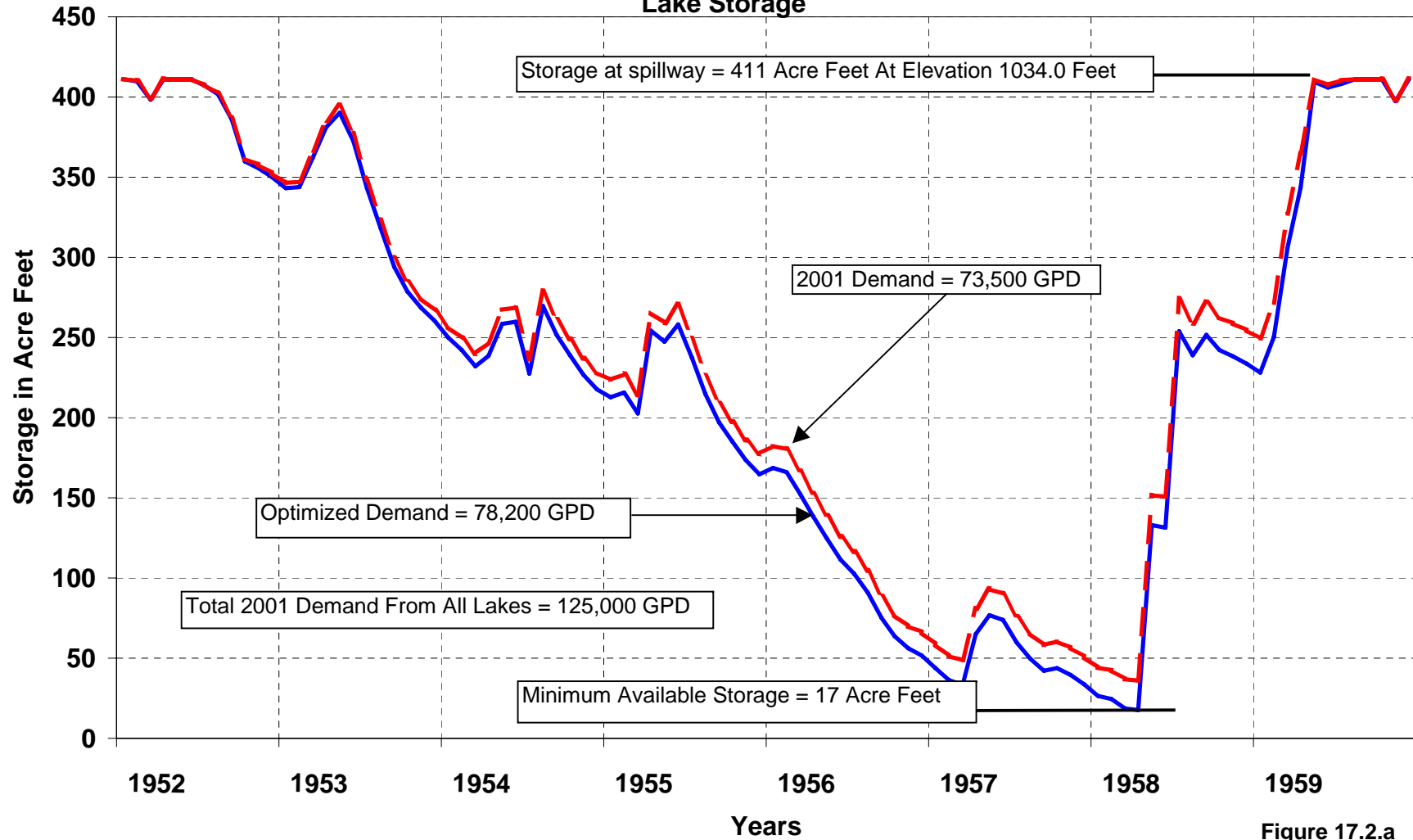
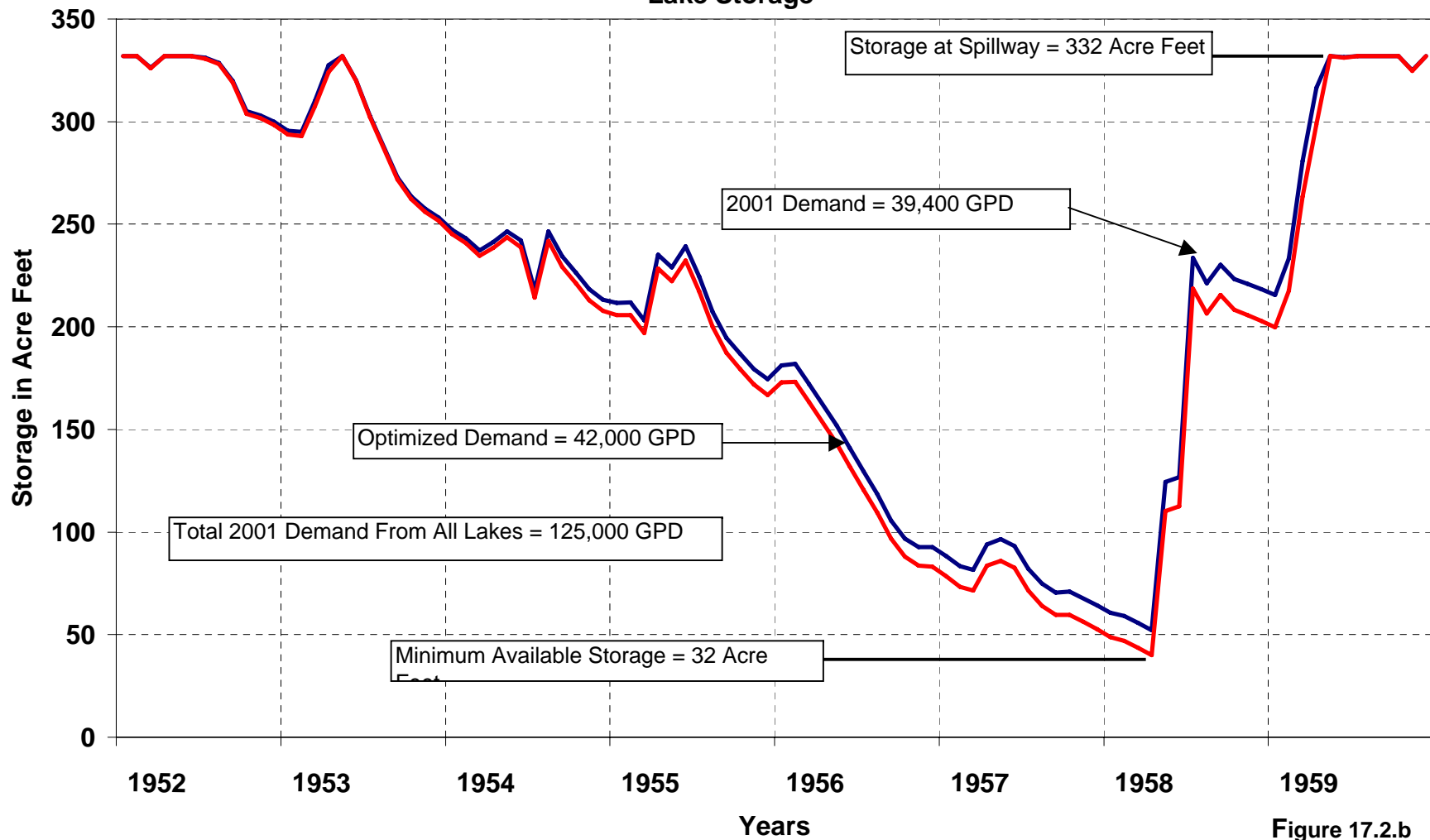


Figure 17.2.a

King City, Missouri
Water Supply Study
Lower North Lake No. 1
Lake Storage



King City, Missouri
Water Supply Study
Middle North Lake No. 2
Lake Storage

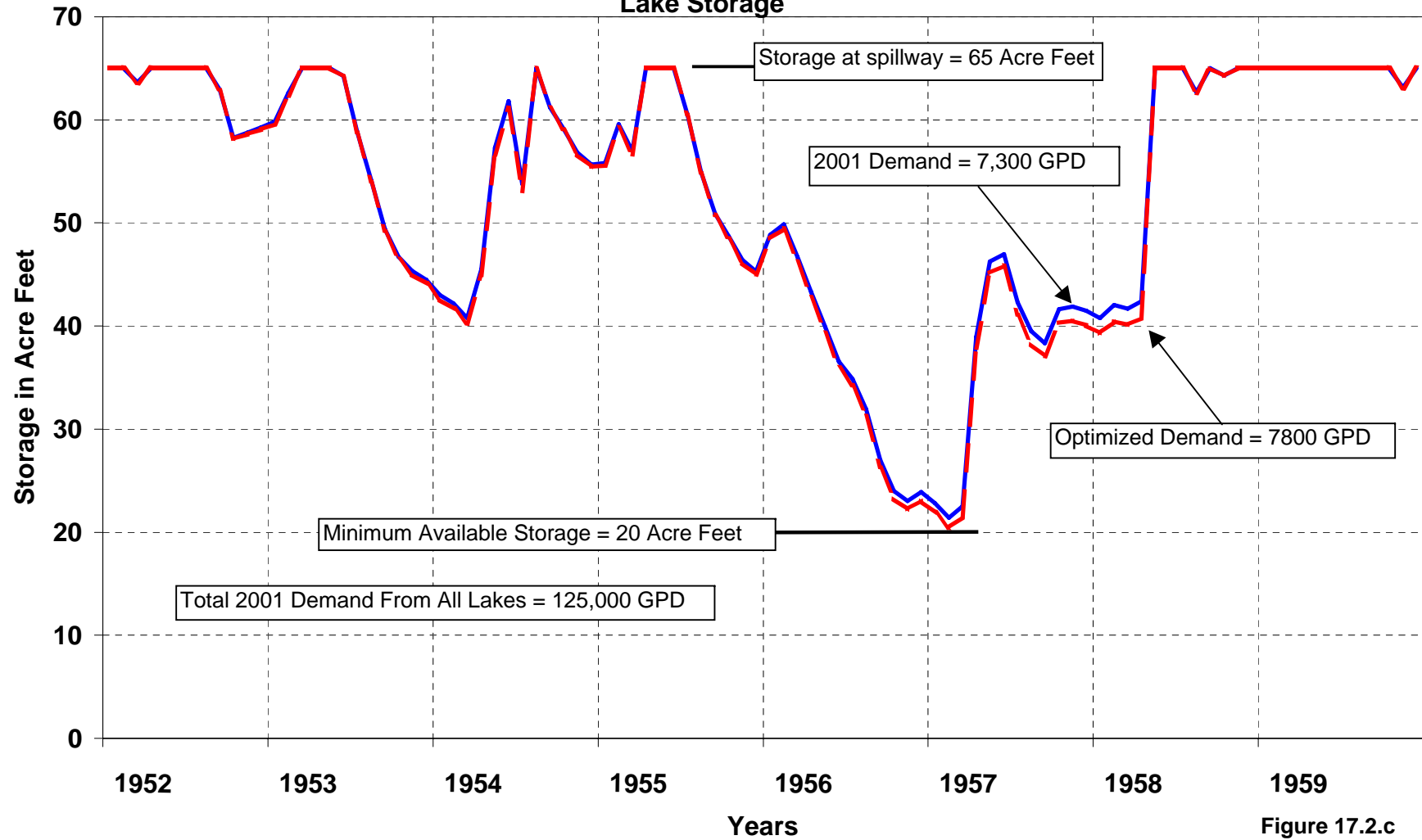


Figure 17.2.c

King City, Missouri
Water Supply Study
Upper North Lake No 3
Lake Storage

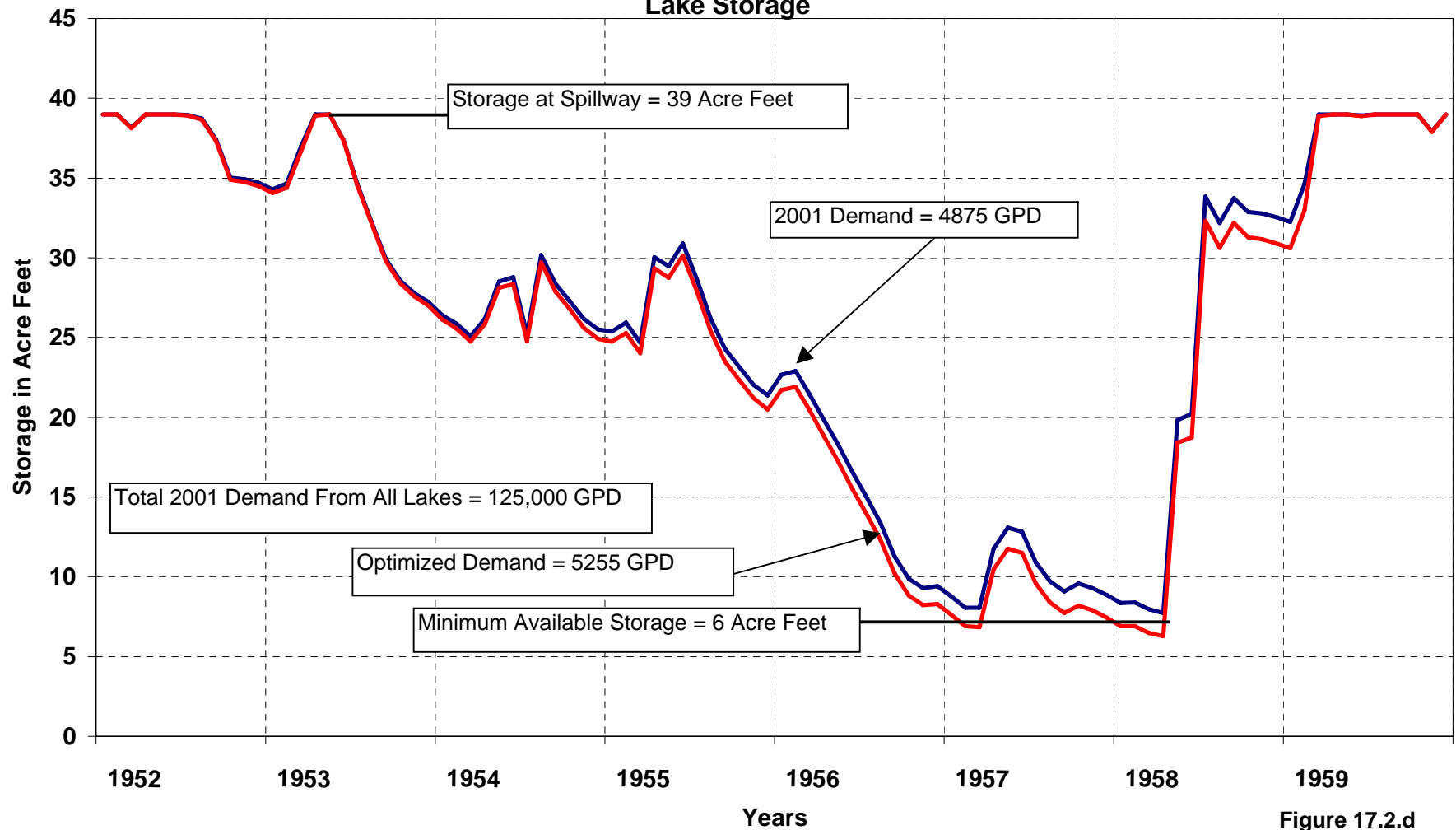


Figure 17.2.d

King City, Missouri

Water Supply Study

Water Use

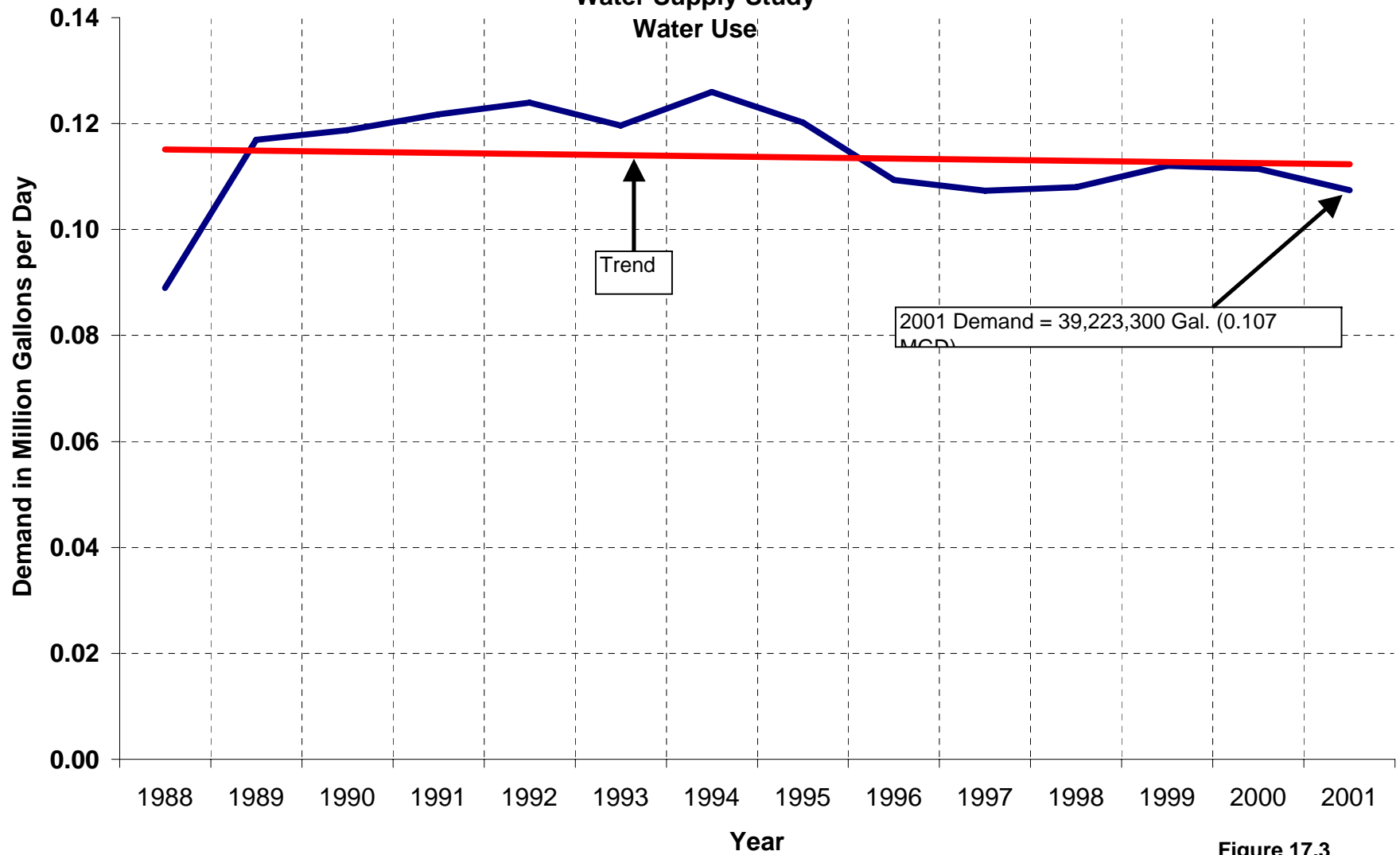
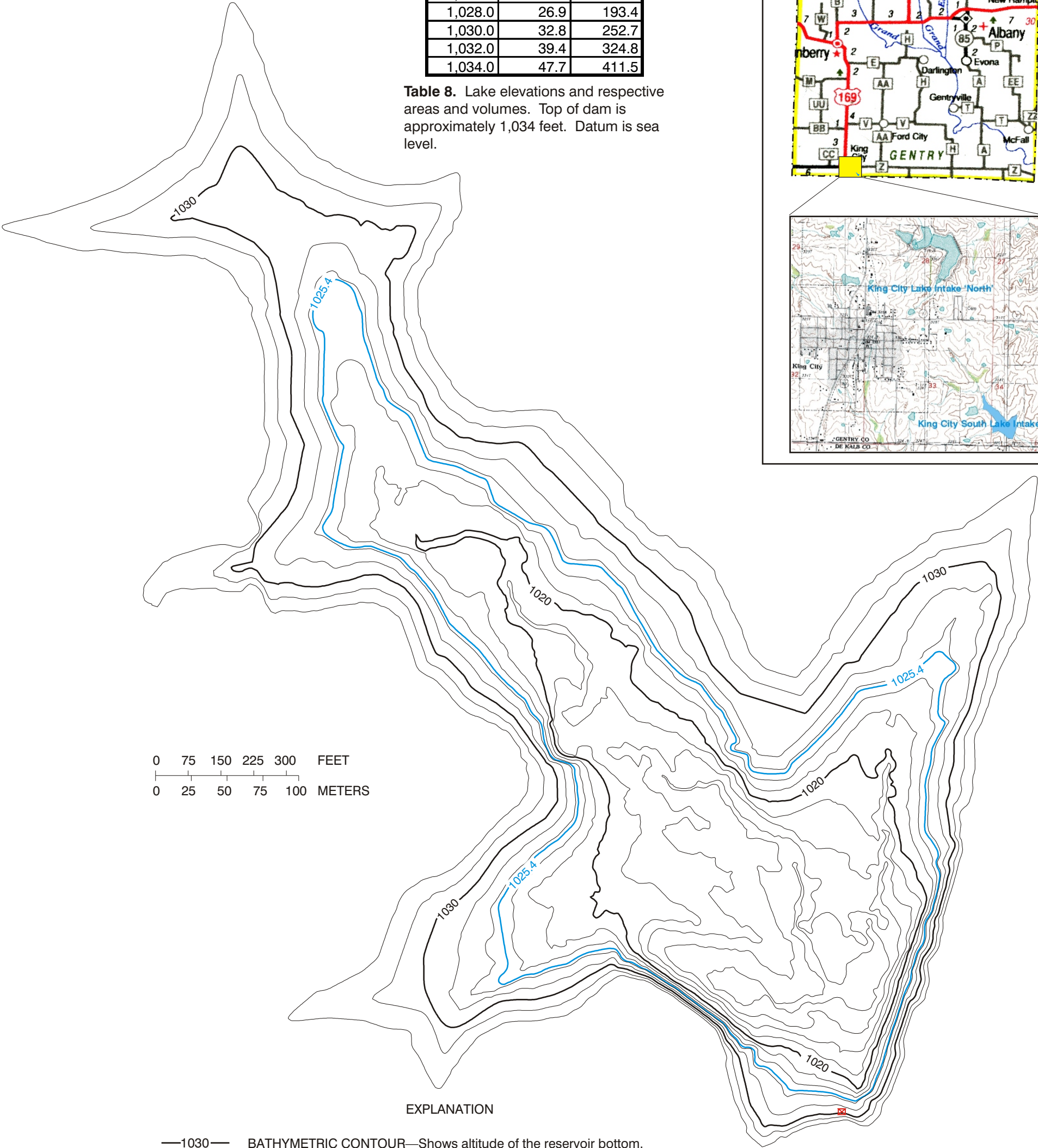
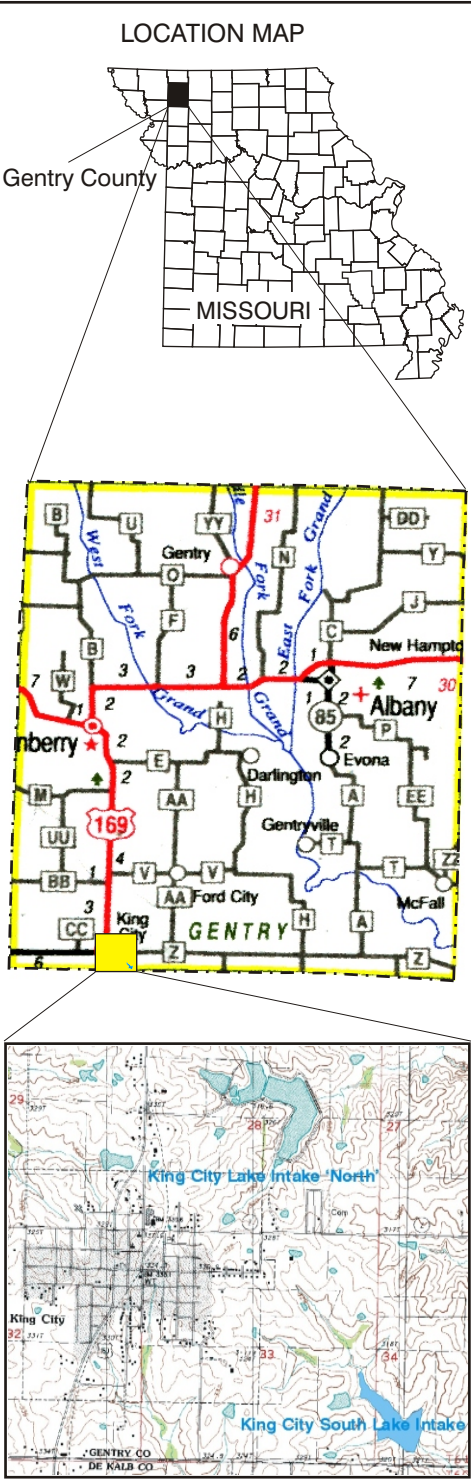


Figure 17.3

KING CITY SOUTH LAKE

Elevation (feet)	Area (acres)	Volume (acre-ft)
1,012.0	0.6	0.4
1,014.0	2.4	3.0
1,016.0	5.2	10.6
1,018.0	8.1	23.9
1,020.0	11.3	43.4
1,022.0	15.1	69.5
1,024.0	18.6	103.5
1,025.4	21.1	131.2
1,026.0	22.4	144.2
1,028.0	26.9	193.4
1,030.0	32.8	252.7
1,032.0	39.4	324.8
1,034.0	47.7	411.5

Table 8. Lake elevations and respective areas and volumes. Top of dam is approximately 1,034 feet. Datum is sea level.



- EXPLANATION**
- 1030— BATHYMETRIC CONTOUR—Shows altitude of the reservoir bottom. Contour interval 2 feet. Datum is sea level.
 - 1025.4— WATER SURFACE—Shows elevation of water surface, July 19, 2000 (table 7).Datum is sea level.
 - ☒ U.S. GEOLOGICAL SURVEY REFERENCE MARKER—Chiseled square located on east side of boat ramp (unstable surface). Elevation 1029.8 feet. Datum is sea level.

Figure 7. Bathymetric map and table of areas/volumes of the King City South Lake near King City, Missouri.